

IBM PROJECT

SMART SOLUTIONS FOR RAILWAYS

SUMBITTTED BY

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INTRODUCTION

1.1 PROJECT OVERVIEW

SMART SOLUTIONS FOR RAILWAYS is to manage Indian Railways is the largest railway network in Asia and additionally world's second largest network operated underneath a single management. Due to its large size it is difficult to monitor the cracks in tracks manually. This paper deals with this problem and detects cracks in tracks with the help of ultrasonic sensor attached to moving assembly with help of stepper motor. Ultrasonic sensor allows the device to moves back and forth across the track and if there is any fault, it gives information to the cloud server through which railway department is informed on time about cracks and many lives can be saved. This is the application of IoT, due to this it is cost effective system. This effective methodology of continuous observation and assessment of rail tracks might facilitate to stop accidents. This methodology endlessly monitors the rail stress, evaluate the results and provide the rail break alerts such as potential buckling conditions, bending of rails and wheel impact load detection to the concerned authorities.

1.2 PURPOSE

Internet is basically system of interconnected computers through network. But now its use is changing with changing world and it is not just confined to emails or web browsing. Today's internet also deals with embedded sensors and has led to development of smart homes, smart rural area, e-health care's etc. and this introduced the concept of IoT . Internet of Things refers to

interconnection or communication between two or more devices without human-to-human and human-to-computer interaction. Connected devices are equipped with sensors or actuators perceive their surroundings. IOT has four major components which include sensing the device, accessing the device, processing the information of the device, and provides application and services. In addition to this it also provides security and privacy of data . Automation has affected every aspect of our daily lives. More improvements are being introduced in almost all fields to reduce human effort and save time. Thinking of the same is trying to introduce automation in the field of track testing. Railroad track is an integral part of any company's asset base, since it provides them with the necessary business functionality. Problems that occur due to problems in railroads need to be overcome. The latest method used by the Indian railroad is the tracking of the train track which requires a lot of manpower and is time-consuming

2.

LITERATURE SURVEY

2.1 EXISTING SYSTEM

In the Existing train tracks are manually researched. LED (Light Emitting Diode) and LDR (Light Dependent Resister) sensors cannot be implemented on the block of the tracks]. The input image processing is a clamorous system with high cost and does not give the exact result. The Automated Visual Test Method is a complicated method as the video color inspection is implemented to examine the cracks in rail track which does not give accurate result in bad weather. This traditional system delays transfer of information. Srivastava et al., (2017) proposed a moving gadget to detect the cracks with the help of an array of IR sensors to identify the actual position of the cracks as well as notify to nearest railway station . Mishra et al., (2019) developed a system to track the cracks with the help of Arduino mega power using solar energy and laser. A GSM along with a GPS module was implemented to get the actual location of the faulty tracks to inform the authorities using SMS via a link to find actual location on Google Maps. Rizvi Aliza Raza presented a prototype in that is capable of capturing photos of the track and compare it with the old database and sends a message to the authorities regarding the crack detected. The detailed analysis of traditional railway track fault detection techniques is explained in table

2.2 REFERENCES

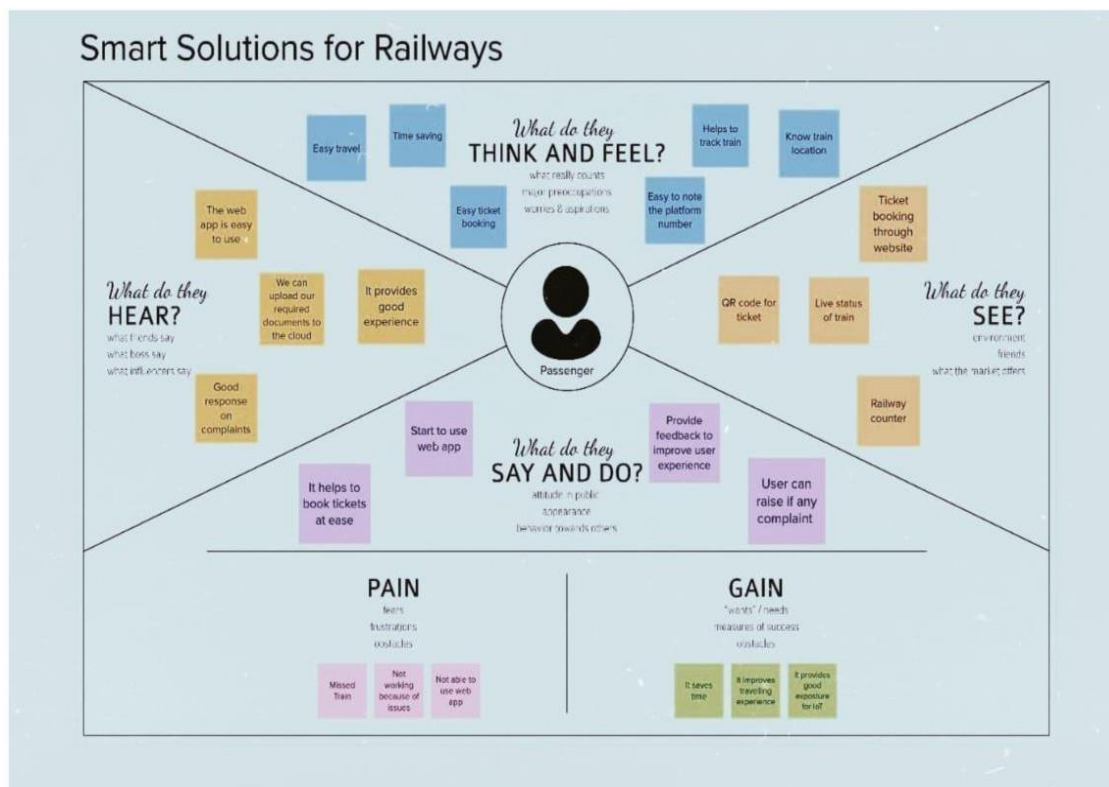
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3. S. Somalraju, V. Murali, G. saha and V. Vaidehi, “Title-robust railway crack detection scheme using LED (Light Emitting Diode) - LDR (Light Dependent Resistor) assembly IEEE 2012.
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7. N. Bhargav, A. Gupta, M. Khirwar, S. Yadav, and V. Sahu, “Automatic Fault Detection of Railway Track System Based on PLC (ADOR TAST)”, International Journal of Recent Research Aspects, Vol. 3, pp. 91-94, 2016

2.3 PROBLEM STATEMENT DEFINITION


Among the various modes of transport, railways is one of the biggest modes of transport in the world. Though there are competitive threats from airlines, luxury buses, public transports, and personalized transports the problem statement is to answer the question “What are the problems faced by the passengers while travelling by train at station and on board”

3. IDEATION AND PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS



3.2 IDEATION & BRAINSTORMING



Brainstorm & idea prioritization

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

- 🕒 10 minutes to prepare
- 🕒 1 hour to collaborate
- 👤 2-8 people recommended

Before you collaborate

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.

🕒 10 minutes

- A Team gathering**
Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.
- B Set the goal**
Think about the problem you'll be focusing on solving in the brainstorming session.
- C Learn how to use the facilitation tools**
Use the Facilitation Superpowers to run a happy and productive session.

Open article →

1 Define your problem statement

What problem are you trying to solve? Frame your problem as a *How Might We* statement. This will be the focus of your brainstorm.

🕒 5 minutes

PROBLEM

How might we [your problem statement]?

Key rules of brainstorming

To run an smooth and productive session

- 🕒 Stay in topic.
- 💡 Encourage wild ideas.
- 🕒 Defer judgment.
- 👂 Listen to others.
- 🗣️ Go for volume.
- 👁️ If possible, be visual.

2

Brainstorm

Write down any ideas that come to mind that address your problem statement.

🕒 10 minutes

Boopathi S

Develop a web application to book a train ticket & to track status of train

Use cloud technology to provide better personalized experience

Upload the required documents to cloud

Provide good UI to increase user experience and make people book ticket easily.

Anbazhagan E

Merging Biometric informations in tickets and using biometric devices to retrieve ticket

Give people a feature through web application using IOT to track the status of train by 24x7

Acquire passenger's feedback to solve their problem in travelling.

Sandeep I

Notify about the platform number through SMS

Notify passenger's about the status of train in regards of any situation

Informing the passenger about the proof of documents before the journey through SMS

Karthik M

Allocate separate compartments for women with infants to travel

Ask for their confirmation to travel on the particular day through web-App or email two or three days before the travel day

Generate QR code for every reservation to hold the personal details with address proof

3

Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. In the last 10 minutes, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you and break it up into smaller sub-groups.

🕒 20 minutes

Using Internet of Things

Merging Biometric informations in tickets and using biometric devices to retrieve ticket

Give people a feature through web application using IOT to track the status of train by 24x7

Using Cloud Technology

Use cloud technology to provide better personalized experience

Upload the required documents to cloud

Generate QR code for every reservation to hold the personal details with address proof

Using Web Application

Notify passenger's about the status of train in regards of any situation

Give people a feature through web application using IOT to track the status of train by 24x7

Provide good UI to increase user experience in tickets reservation system

Ask for their confirmation to travel on the particular day through web-App or email two or three days before the travel day

Acquire passenger's feedback to solve their problem in travelling.

Informing the passenger about the proof of documents before the journey through SMS

Notify about the platform number through SMS

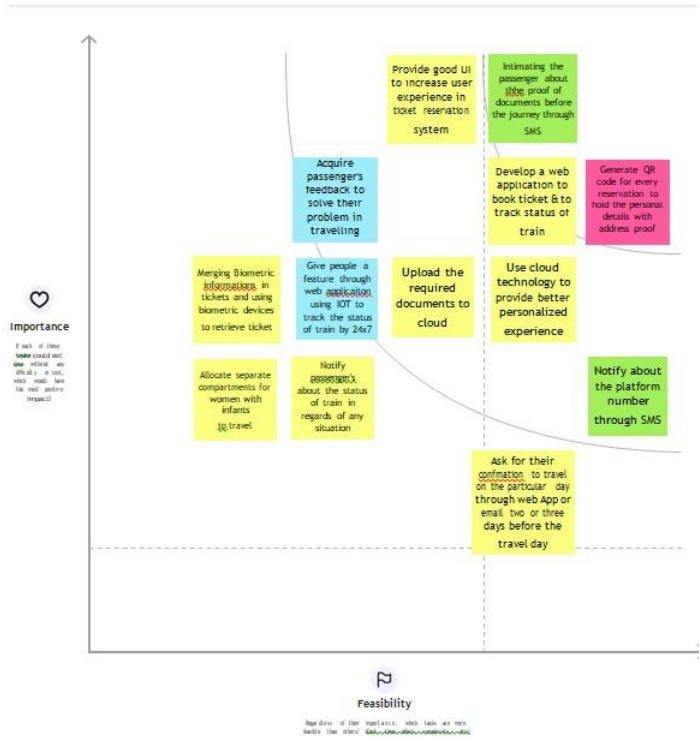
Allocate separate compartments for women with infants to travel

1

Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

20 minutes



2

After you collaborate

You can export the mural as an image or pdf to share with members of your company who might find it helpful.

QUICK ACTIONS

1. Share the mural: Share a view link to the mural with stakeholders to keep them in the loop about the outcomes of the session.
2. Export the mural: Export a copy of the mural as a PNG or PDF to attach to emails, include in slides, or save in your drive.

Keep moving forward

1. Strategy Blueprint: Define the components of a new idea or strategy. Open the template →
2. Service experience journey map: Understand customer needs, motivations, and obstacles for an experience. Open the template →
3. Strengths, Weaknesses, Opportunities & Threats matrix (SWOT) to develop a plan. Open the template →

Share template feedback

3.2 PROPOSED SOLUTION

| S.NO | PARAMETERS | DESCRIPTIONS |
|------|---|--|
| 1 | Problem Statement (Problem to be solved) | In order to satisfy the passengers, the Railways provides various services to its passengers But, the passengers can face some problems. |
| 2 | Idea / Solution description | The idea is to minimize the ticket booking problems among the passengers by providing Online mode of booking rather than papers. . In queues in front of the ticket counters in railway stations have been drastically increased over the time. |
| 3 | Novelty / Uniqueness | Online mode of booking is most common and so ease of access to everyone that makes more efficient uniqueness of utilizing the technique. People can book their ticket through online and they get a QR code through SMS |
| 4 | Social Impact / Customer Satisfaction | Customers for sure they get satisfied as they are in the fast roaming world this technique makes more easier for travelling passengers. A web page is designed in which the user can book tickets and will be provided with the QR code, which will be shown to the ticket collector and by scanning the QR code the ticket collector will get the passenger details |

| | | |
|---|-----------------------------------|--|
| 5 | Business Model (Revenue Model) | A web page is designed in which the user can book tickets and will be provided with the QR code, which will be shown to the ticket collector and by scanning the QR code the ticket collector will get the passenger details. The booking details of the user will be stored in the database, which can be retrieved any time |
| 6 | Scalability of the Solution | The scalability of this solution is most feasible among the passengers who are willing to travel. No need of taking printout Counter ticket has to be handled with care, but SMS on mobile is enough. No need to taking out wallet and showing your ticket to TTR just tell your name to TTR that you are a passenger with valid proof |

3.3 Problem Solution fit

Purpose / Vision: Managing waste for the better environment and for the safe and secure of people

| | | | | |
|--|--|---|--|---|
| Define CS, fit into CC | 1. CUSTOMER SEGMENT(S) CS <p>Passengers who are travelling in the train and ticket collector</p> | 6. CUSTOMER CC <p>Reducing the paper work of customer.</p> | 5. AVAILABLE SOLUTIONS AS <p>A webpage is designed in which the user can book tickets and will be provided with a QR code which will be shown to the ticket collector and the ticket collector will be scanning the QR code to get the passenger details.</p> | Explore AS, differentiate understand RC |
| | 2. JOBS-TO-BE-DONE / PROBLEMS J&P <p>In their busy schedule as fast roaming world public in need of online booking process. The queues in front of the ticket counters in railway stations have been drastically increased over the period of time</p> | 9. PROBLEM ROOT CAUSE RC <p>The main reason for the problem that has occurred for due to lack of technology earlier since passengers find it difficult to book the ticket and track the location of train. To overcome this problem we have introduced QR code and GPS tracker for booking the ticket and finding the location of the train</p> | 7. BEHAVIOUR BE <p>By listening to the customer we can provide genuine empathy for the problem regarded. By looking over the ration session we can easily find out how the customer gets issues while using the application.</p> | |
| Focus on J&P, tap into BE, understand RC | 3. TRIGGERS TR <p>Saves paper and work load</p> | 10. YOUR SOLUTION SL <p>*A webpage is designed in which the user can book tickets and will be provided with a QR code which will be shown to the ticket collector and the ticket collector will be scanning the QR code to get the passenger details. * The webpage also shows the live locations of the train by placing a GPS module in the train. The location of the journey will be updated continuously in the webpage. * The booking details of the user will be stored in the database which can be retrieved anytime.</p> | 6. CHANNELS of BEHAVIOUR CH ONLINE <p>People can book their tickets through online and they get a QR code through sms</p> | Extract online & offline CH of BE |
| | 4. EMOTIONS: BEFORE / AFTER EM <ul style="list-style-type: none"> NO NEED OF TAKING PRINT OUT COUNTER TICKET HAS TO BE HANDLED WITH CARE, BUT SMS ON MOBILE IS ENOUGH. YOU ARE BECOMING ENVIRONMENT FRIENDLY AND CONTRIBUTING FOR GREENER PLANET BY IGNORING PRINTOUT. NO NEED OF TAKING OUT WALLET AND SHOWING YOUR TICKET TO TTR, JUST TELL YOUR NAME TO TTR THAT YOU ARE PASSENGER WITH A VALID PROOF. WHILE BOOKING COUNTER TICKET YOU HAD TO CARRY CASH AND WHILE BOOKING E-TICKET YOU ARE PAYING THROUGH ONLINE DIRECTLY FROM BANK WHICH MAKES WORK MORE EASY FOR YOU. | | OFFLINE <p>In web application passenger details is stored and the ticket collector can view their details at any time.</p> | |
| Identify strong TR & EM | | | | |

REQUIREMENT ANALYSIS

4.1. FUNCTIONAL REQUIREMENTS

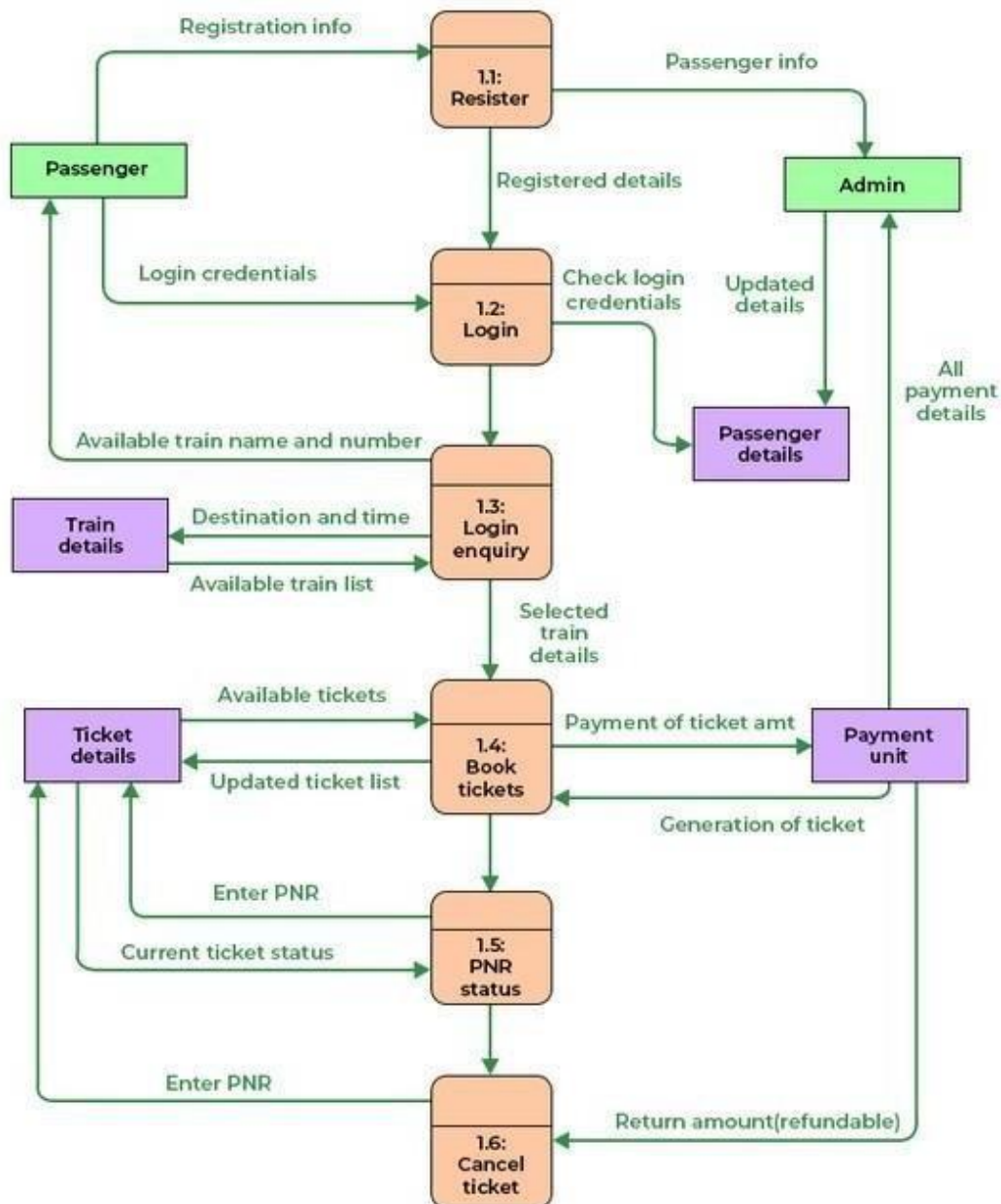
| FR No. | Functional Requirement (Epic) | Sub Requirement (Story / Sub-Task) |
|--------|-------------------------------|--|
| FR-1 | Unique accounts | <ul style="list-style-type: none"> • Every online booking needs to be associated with an account • One account cannot be associated with multiple users |
| FR-2 | Booking options | <ul style="list-style-type: none"> □ Search results should enable users to find the most recent and relevant booking options |
| FR-3 | Mandatory fields | <ul style="list-style-type: none"> □ System should only allow users to move to payment only when mandatory fields such as date, time, location has been mentioned |
| FR-4 | Synchronization | <ul style="list-style-type: none"> □ System should consider timezone synchronisation when accepting bookings from different timezones |
| FR-5 | Authentication | <ul style="list-style-type: none"> □ Booking confirmation should be sent to user to the specified contact details |

4.2. NON-FUNCTIONAL REQUIREMENTS

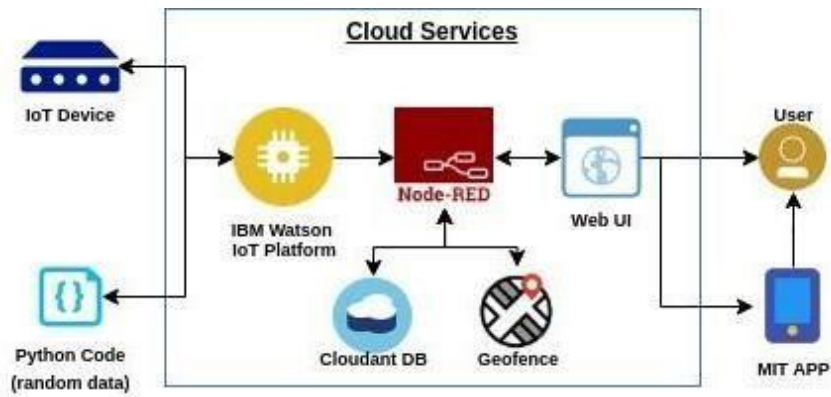
| FR No. | Non-Functional Requirement | Description |
|---------------|-----------------------------------|--|
| NFR-1 | Usability | <input type="checkbox"/> Search results should populate within acceptable time limits |
| NFR-2 | Security | <input type="checkbox"/> System should visually confirm as well as send booking confirmation to the user's contact |
| NFR-3 | Reliability | <input type="checkbox"/> System should accept payments via different payment methods, like PayPal, wallets, cards, vouchers, etc |
| NFR-4 | Performance | <input type="checkbox"/> Search results should populate within acceptable time limits |
| NFR-5 | Availability | <input type="checkbox"/> User should be helped appropriately to fill in the mandatory fields, incase of invalid input |
| NFR-6 | Scalability | <input type="checkbox"/> Use of captcha and encryption to avoid bots from booking tickets |

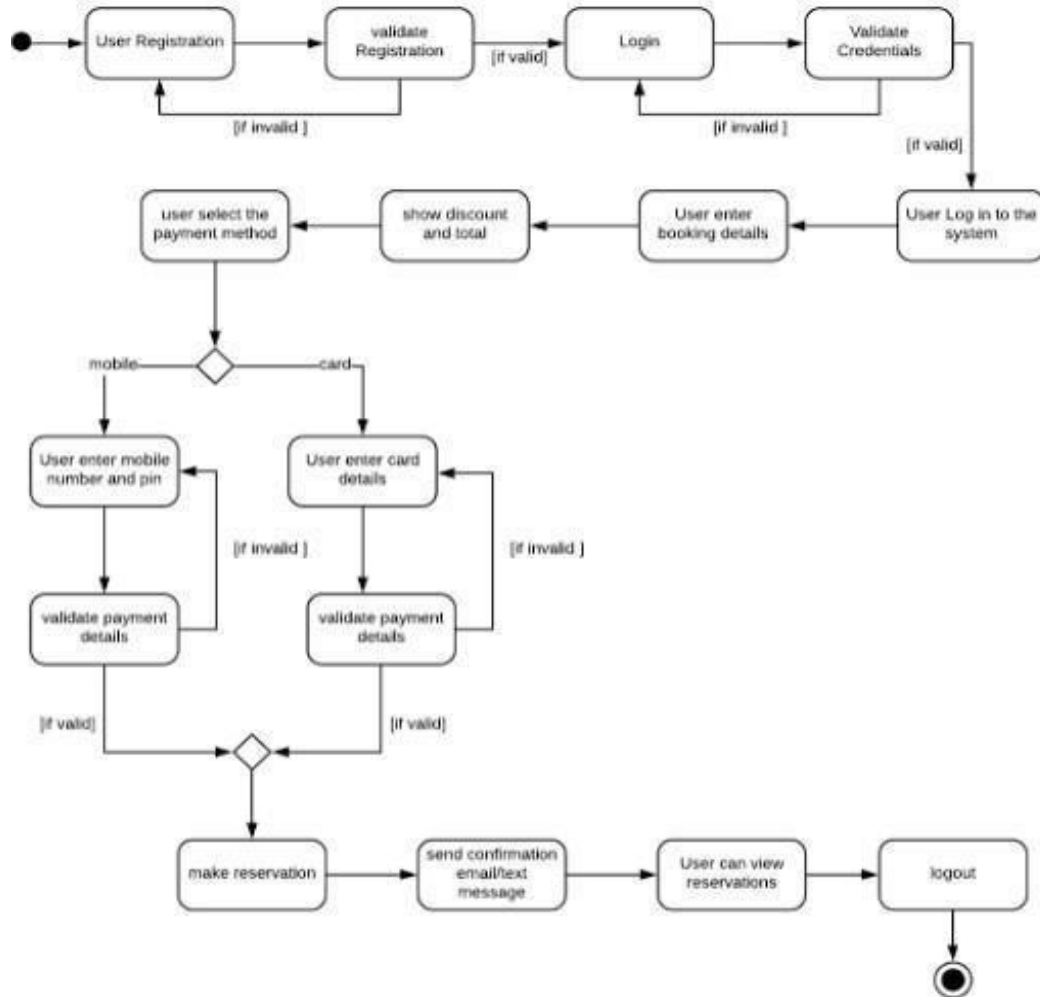
5.PROJECT DESIGN

5.1 DATA FLOW DIAGRAMS



5.2 SOLUTION & TECHNICAL ARCHITECTURE





5.3 USER STORIES

| User Type | Functional Requirement (Epic) | User Story Number | User Story / Task | Acceptance criteria | Priority | Release |
|-------------------------------------|-------------------------------|-------------------|--|--|----------|----------|
| Customer (Mobile user, Web user) | Registration | USN-1 | As a user, I can register through the form by Filling in my details | I can register and create my account / dashboard | High | Sprint-1 |
| | | USN-2 | As a user, I can register through phone numbers, Gmail, Facebook or other social sites | I can register & create my dashboard with Facebook login or other social sites | High | Sprint-2 |

| | | | | | | |
|------------------|--------------------------------------|--------------------------|--|--|-----------------|----------------|
| | Conformation | USN-3 | As a user, I will receive confirmation through email or OTP once registration is successful | I can receive confirmation email & click confirm. | High | Sprint-1 |
| | Authentication/Login | USN-4 | As a user, I can login via login id and password or through OTP received on register phone number | I can login and access my account/dashboard | High | Sprint-1 |
| | Display Train details | USN-5 | As a user, I can enter the start and destination to get the list of trains available connecting the above | I can view the train details (name & number), corresponding routes it passes through based on the start and destination entered. | High | Sprint-1 |
| | Booking | USN-6 | As a use, I can provide the basic details such as a name, age, gender etc... | I will view, modify or confirm the details enter. | High | Sprint-1 |
| | | USN-7 | As a user, I can choose the class, seat/berth. If a preferred seat/berth isn't available I can be allocated based on the availability. | I will view, modify or confirm the seat/class berth selected | High | Sprint-1 |
| | Payment | USN-8 | As a user, I can choose to pay through credit Card/debit card/UPI. | I can view the payment Options available and select my desirable choice To proceed with the payment | High | Sprint-1 |
| | | USN-9 | As a user, I will be redirected to the selected Payment gateway and upon successful | I can pay through the payment portal and confirm the booking if any changes need to | High | Sprint-1 |
| User Type | Functional Requirement (Epic) | User Story Number | User Story / Task | Acceptance criteria | Priority | Release |
| | | | completion of payment I'll be redirected to the booking website. | be done I can move back to the initial payment page | | |

| | | | | | | |
|-------------------------|------------------------|--------|--|--|--------|----------|
| | Ticket generation | USN-10 | As a user, I can download the generated e-ticket for my journey along with the QR code which is used for authentication during my journey. | I can show the generated QR code so that authentication can be done quickly. | High | Sprint-1 |
| | Ticket status | USN-11 | As a user, I can see the status of my ticket Whether it's confirmed/waiting/RAC. | I can confidentially get the Information and arrange alternate transport if the ticket isn't Confirmed | High | Sprint-1 |
| | Reminders notification | USN-12 | As a user, I get reminders about my journey A day before my actual journey. | I can make sure that I don't miss the journey because of the constant notifications. | Medium | Sprint-2 |
| | | USN-13 | As a user, I can track the train using GPS and can get information such as ETA, Current stop and delay. | I can track the train and get to know about the delays pian accordingly | Medium | Sprint-2 |
| | Ticket cancellation | USN-14 | As a user, I can cancel my tickets if there's any Change of plan | I can cancel the ticket and get a refund based on how close the date is to the journey. | High | Sprint-1 |
| | Raise queries | USN-15 | As a user, I can raise queries through the query box or via mail. | I can view my pervious queries. | Low | Sprint-2 |
| Customer care Executive | Answer the queries | USN-16 | As a user, I will answer the questions/doubts Raised by the customers. | I can view the queries and make it once resolved | Medium | Sprint-2 |
| Administrator | Feed details | USN-17 | As a user, I will feed information about the trains delays and add extra seats if a new compartment is added. | I can view and ensure the corrections of the information fed. | High | Sprint-1 |

6.PROJECT PLANNING AND SCHEDULING

6.1 SPRINT PLANNING& ESTIMATION

| Sprint | Functional Requirement (Epic) | User Story Number | User Story / Task | Story Points | Priority | Team Members |
|----------|-------------------------------|-------------------|---|--------------|----------|--------------|
| Sprint-1 | Registration | USN-1 | As a user, I can register through the form by Filling in my details | 2 | High | Anbazhagan |
| Sprint-1 | | USN-2 | As a user, I can register through phone numbers, Gmail, Facebook or other social sites | 1 | High | Boopathi |
| Sprint-1 | Conformation | USN-3 | As a user, I will receive confirmation through email or OTP once registration is successful | 2 | Low | Sandeep |
| Sprint-1 | login | USN-4 | As a user, I can login via login id and password or through OTP received on register phone number | 2 | Medium | Karthik |
| Sprint-1 | Display Train details | USN-5 | As a user, I can enter the start and destination to get the list of trains available connecting the above | 1 | High | Anbazhagan |
| Sprint-2 | Booking | USN-6 | As a use, I can provide the basic details such as a name, age, gender etc... | 2 | High | Boopathi |
| Sprint-2 | | USN-7 | As a user, I can choose the class, seat/berth. If a preferred seat/berth isn't available I can be allocated based on the availability | 1 | Low | Sandeep |













| | | | | | | |
|----------|------------------------|--------|---|---|--------|------------|
| Sprint-2 | Payment | USN-8 | As a user, I can choose to pay through credit Card/debit card/UPI. | 1 | High | Karthik |
| Sprint-2 | | USN-9 | As a user, I will be redirected to the selected | 2 | High | Anbazhagan |
| Sprint-3 | Ticket generation | USN-10 | As a user, I can download the generated e- ticket for my journey along with the QR code which is used for authentication during my journey. | 1 | High | Boopathi |
| Sprint-3 | Ticket status | USN-11 | As a user, I can see the status of my ticket | 2 | High | Sandeep |
| | | | Whether it's confirmed/waiting/RAC. | | | |
| Sprint-3 | Reminders notification | USN-12 | As a user, I get reminders about my journey A day before my actual journey. | 1 | High | Karthik |
| Sprint-3 | Ticket cancellation | USN-13 | As a user, I can track the train using GPS and can get information such as ETA, Current stop and delay | 2 | High | Anbazhagan |
| Sprint-4 | | USN-14 | As a user, I can cancel my tickets if there's any Change of plan | 1 | High | Boopathi |
| Sprint-4 | Raise queries | USN-15 | As a user, I can raise queries through the query box or via mail. | 2 | Medium | Sandeep |
| Sprint-4 | Answer the queries | USN-16 | As a user, I will answer the questions/doubts Raised by the customers. | 2 | High | Karthik |
| Sprint-4 | Feed details | USN-17 | As a user, I will feed information about the trains delays and add extra seats if a new compartment is added. | 1 | High | Anbazhagan |

6.2 SPRINT DELIVERY SCHEDULE

| Sprint | Total Story Points | Duration | Sprint Start Date | Sprint End Date (Planned) | Story Points Completed (as on Planned End Date) | Sprint Release Date (Actual) |
|----------|--------------------|----------|-------------------|---------------------------|---|------------------------------|
| Sprint-1 | 20 | 6 Days | 24 Oct 2022 | 29 Oct 2022 | 20 | 29 Oct 2022 |
| Sprint-2 | 20 | 6 Days | 31 Oct 2022 | 05 Nov 2022 | 20 | 5 Nov 2022 |
| Sprint | Total Story Points | Duration | Sprint Start Date | Sprint End Date (Planned) | Story Points Completed (as on Planned End Date) | Sprint Release Date (Actual) |
| Sprint-3 | 20 | 6 Days | 07 Nov 2022 | 12 Nov 2022 | 20 | 12 Nov 2022 |
| Sprint-4 | 20 | 6 Days | 14 Nov 2022 | 19 Nov 2022 | 20 | 19 Nov 2022 |

6.1. REPORTS FROM JIRA



| | 13 | 14 | 15 | 16 | NOV 17 | 18 | 19 |
|--|---------------|----|----|----|--------|----|----|
| Sprints | SSFR Sprint 4 | | | | | | |
| >  SSFR-23 registration | | | | | | | |
| >  SSFR-24 booking | | | | | | | |
| >  SSFR-25 payment | | | | | | | |
| >  SSFR-26 redirect | | | | | | | |
| >  SSFR-27 ticket generation\ | | | | | | | |
| >  SSFR-28 status | | | | | | | |
| >  SSFR-29 notification | | | | | | | |
| >  SSFR-30 tracking location | | | | | | | |
| >  SSFR-31 cancellation | | | | | | | |
| >  SSFR-32 raise queries | | | | | | | |
| >  SSFR-33 ans queries | | | | | | | |
| >  SSFR-34 feed details | | | | | | | |

CODING AND SOLUTIONING

7.1. FEATURE 1

- IOT device
- IBM Watson platform
- Node red
- Cloudbant DB
- Web UI
- Geofence □ MIT App
- Python code

7.2. FEATURE 2

- Registration
- Login
- Verification
- Ticket Booking
- Payment
- Ticket Cancellation
- Adding Queries

PYTHON SCRIPT TO GENERATE RANDOM GPS DATA

```
import time
import sys
import ibmiotf.application
import ibmiotf.device
import random
import requests
import json

#Provide your IBM Watson Device Credentials
organization = "0z828r"
deviceType = "iotdevice"          #Credentials of Watson IoT sensor simulator
deviceId = "1001"
authMethod = "token"
authToken = "sandeep"
# Initialize the device client.
L=0
try:
    deviceOptions = {"org": organization, "type": deviceType, "id": deviceId, "auth-method": authMethod, "auth-token": authToken}
    deviceCli = ibmiotf.device.Client(deviceOptions)
    #.....

except Exception as e:
    print("Caught exception connecting device: %s" % str(e))
    sys.exit()

# Connect and send a datapoint "hello" with value "world" into the cloud as an event of type "greeting" 10 times
deviceCli.connect()
while True:
    overpass_url = "http://overpass-api.de/api/interpreter"
    overpass_query = """
[out:json];area[name="India"];(node[place="village"](area));out;
"""
    response = requests.get(
        overpass_url,
        params={'data': overpass_query}
    )
    coords = []
    if response.status_code == 200:
```

```

    data = response.json()
    places = data.get('elements', [])
    for place in places:
        coords.append((place['lat'], place['lon']))
    print ("Got %s village coordinates!" % len(coords))
    print (coords[0])
else:
    print("Error")

i = random.randint(1,100)
L = coords[i]
#Send random gprs data to node-red to IBM Watson
data = {"d":{ 'Latitude' : L[0], 'Longitude' : L[1]}}
#print data
def myOnPublishCallback():
    print("Published gprs location = ", L, "to IBM Watson")
success = deviceCli.publishEvent("Data", "json", data, qos=0, on_publish=myOnPublishCallback)
time.sleep(12)
if not success:
    print("Not connected to IoT")
time.sleep(1)

deviceCli.disconnect()

```

PYTHON CODE FOR TICKET GENERATION

```
class Ticket:
    counter=0
    def __init__(self,passenger_name,source,destination):
        self.__passenger_name=passenger_name
        self.__source=source
        self.__destination=destination
        self.Counter=Ticket.counter
        Ticket.counter+=1
    def validate_source_destination(self):
        if (self.__source=="Delhi" and (self.__destination=="Pune" or self.__destination=="Mumbai" or
self.__destination=="Chennai" or self.__destination=="Kolkata")):
            return True
        else:
            return False
    def generate_ticket(self ):
        if True:
            __ticket_id=self.__source[0]+self.__destination[0]+"0"+str(self.Counter)
            print( "Ticket id will be:",__ticket_id)
        else:
            return False
    def get_ticket_id(self):
        return self.ticket_id
    def get_passenger_name(self):
        return self.__passenger_name
    def get_source(self):
        if self.__source=="Delhi":
            return self.__source
        else:
            print("you have written invalid soure option")
            return None
    def get_destination(self):
        if self.__destination=="Pune":
            return self.__destination
        elif self.__destination=="Mumbai":
            return self.__destination
        elif self.__destination=="Chennai":
            return self.__destination
```

```
elif self.__destination=="Kolkata":  
    return self.__destination  
else:  
    return None
```

8.TESTING

8.1.TEST CASES

| | | | | 14-Nov-22 | | | | | |
|--------------|--------------|-----------------------|--|---|---------------------------------------|---|---------------------|--------|-------------|
| | | | | Team id: PNT2022TMID29462 | | | | | |
| | | | | Smart Solutions for Railways | | | | | |
| | | | | 4 marks | | | | | |
| Test case ID | Feature Type | Component | Test Scenario | Steps To Execute | Test Data | Expected Result | Actual Result | Status | Executed By |
| 1 | Functional | Registration | Registration through the form by Filling in my details | 1.Click on register 2.Fill the registration form 3.click Register | | Registration form to be filled is to be displayed | Working as expected | PASS | SANDEEP |
| 2 | UI | Generating OTP | Generating the otp for further process | 1.Generating of OTP number | | user can register through phone numbers and to get otp number | Working as expected | PASS | KARTHIK |
| 3 | Functional | OTP verification | Verify user otp using mail | 1.Enter gmail id and enter password 2.click submit | Username: railways password: admin | OTP verified is to be displayed | Working as expected | FAIL | ANBAZHAGAN |
| 4 | Functional | Login page | Verify user is able to log into application with Invalid credentials | 1.Enter into log in page 2.Click on My Account dropdown button 3.Enter Invalid username/email In Email text box 4.Enter valid password in password text box 5.Click on login button | Username: railways password: admin | Application should show 'Incorrect email or password ' validation message. | Working as expected | FAIL | BOOPATHI |
| 5 | Functional | Display Train details | The user can view about the available train details | 1.As a user, I can enter the start and destination to get the list of trains available connecting the above | Username: railways password: admin | A user can view about the available trains to enter start and destination details | Working as expected | PASS | SANDEEP |

9.RESULTS

9.1. PERFORMANCE METRICS



10. ADVANTAGES &DISADVANTAGES

10.1. ADVANTAGES

- Openness – compatibility between different system modules, potentially from different vendors;
- Orchestration – ability to manage large numbers of devices, with full visibility over them;
 - Dynamic scaling – ability to scale the system according to the application needs, through resource virtualization and cloud operation;
- Automation – ability to automate parts of the system monitoring application, leading to better performance and lower operation costs.

10.2. DISADVANTAGES

- Approaches to flexible, effective, efficient, and low-cost data collection for both railway vehicles and infrastructure monitoring, using regular trains;
- Data processing, reduction, and analysis in local controllers, and subsequent sending of that data to the cloud, for further processing;
- Online data processing systems, for real-time monitoring, using emerging communication technologies;
- Integrated, interoperable, and scalable solutions for railway systems preventive maintenance.

11. CONCLUSION

Accidents occurring in Railway transportation system cost a large number of lives. So this system helps us to prevent accidents and giving information about faults or cracks in advance to railway authorities. So that they can fix them and accidents cases becomes less. This project is cost effective. By using more techniques they can be modified and developed according to their applications. By this system many lives can be saved by avoiding accidents. The idea can be implemented in large scale in the long run to facilitate better safety standards for rail tracks and provide effective testing infrastructure for achieving better results in the future.

12. FUTURE SCOPE

In future CCTV systems with IP based camera can be used for monitoring the visual videos captured from the track. It will also increase security for both passengers and railways. GPS can also be used to detect exact location of track fault area, IP cameras can also be used to show fault with the help of video. Locations on Google maps with the help of sensors can be used to detect in which area track is broken

PYTHON CODE FOR LOGIN

```
from tkinter import *
import sqlite3

root = Tk()
root.title("Python: Simple Login Application")
width = 400
height = 280
screen_width = root.winfo_screenwidth()
screen_height = root.winfo_screenheight()
x = (screen_width/2) - (width/2)
y = (screen_height/2) - (height/2)
root.geometry("%dx%d+%d+%d" % (width, height, x, y))
root.resizable(0, 0)

#=====VARIABLES=====
USERNAME = StringVar()
PASSWORD = StringVar()

#=====FRAMES=====
Top = Frame(root, bd=2, relief=RIDGE)
Top.pack(side=TOP, fill=X)
Form = Frame(root, height=200)
Form.pack(side=TOP, pady=20)

#=====LABELS=====
lbl_title = Label(Top, text = "Python: Simple Login Application", font=('arial', 15))
lbl_title.pack(fill=X)
lbl_username = Label(Form, text = "Username:", font=('arial', 14), bd=15)
lbl_username.grid(row=0, sticky="e")
lbl_password = Label(Form, text = "Password:", font=('arial', 14), bd=15)
lbl_password.grid(row=1, sticky="e")
lbl_text = Label(Form)
lbl_text.grid(row=2, columnspan=2)

#=====ENTRY WIDGETS=====
username = Entry(Form, textvariable=USERNAME, font=(14))
username.grid(row=0, column=1)
password = Entry(Form, textvariable=PASSWORD, show="*", font=(14))
password.grid(row=1, column=1)

#=====METHODS=====
def Database():
    global conn, cursor
    conn = sqlite3.connect("pythontut.db")
```

```

cursor = conn.cursor()
cursor.execute("CREATE TABLE IF NOT EXISTS `member` (mem_id INTEGER NOT NULL PRIMARY KEY AUTOINCREMENT,
username TEXT, password TEXT)")
cursor.execute("SELECT * FROM `member` WHERE `username` = 'admin' AND `password` = 'admin'")
if cursor.fetchone() is None:
    cursor.execute("INSERT INTO `member` (username, password) VALUES('admin', 'admin')")
    conn.commit()
def Login(event=None):
    Database()
    if USERNAME.get() == "" or PASSWORD.get() == "":
        lbl_text.config(text="Please complete the required field!", fg="red")
    else:
        cursor.execute("SELECT * FROM `member` WHERE `username` = ? AND `password` = ?", (USERNAME.get(),
PASSWORD.get()))
        if cursor.fetchone() is not None:
            HomeWindow()
            USERNAME.set("")
            PASSWORD.set("")
            lbl_text.config(text="")
        else:
            lbl_text.config(text="Invalid username or password", fg="red")
            USERNAME.set("")
            PASSWORD.set("")
    cursor.close()
    conn.close()

#=====BUTTON WIDGETS=====
btn_login = Button(Form, text="Login", width=45, command=Login)
btn_login.grid(pady=25, row=3, columnspan=2)
btn_login.bind('<Return>', Login)

def HomeWindow():
    global Home
    root.withdraw()
    Home = Toplevel()
    Home.title("Python: Simple Login Application")
    width = 600
    height = 500
    screen_width = root.winfo_screenwidth()
    screen_height = root.winfo_screenheight()
    x = (screen_width/2) - (width/2)
    y = (screen_height/2) - (height/2)
    root.resizable(0, 0)
    Home.geometry("%dx%d+%d+%d" % (width, height, x, y))

```

```

lbl_home = Label(Home, text="Successfully Login!", font=('times new roman', 20)).pack()
btn_back = Button(Home, text='Back', command=Back).pack(pady=20, fill=X)

def Back():
    Home.destroy()
    root.deiconify()

```

PYTHON CODE FOR OTP GENERATION:

```

# import library
import math, random

# function to generate OTP
def generateOTP() :

    # Declare a digits variable
    # which stores all digits
    digits = "0123456789"
    OTP = ""

    # length of password can be changed
    # by changing value in range
    for i in range(4) :
        OTP += digits[math.floor(random.random() * 10)]

    return OTP

# Driver code
if __name__ == "__main__" :

    print("OTP of 4 digits:", generateOTP())

```

PYTHON CODE FOR OTP VERIFICATION

```
import os
import math
import random
import smtplib
digits = "0123456789"
OTP = ""
for i in range (6):
    OTP += digits[math.floor(random.random()*10)]

otp = OTP + " is your OTP"
message = otp
s = smtplib.SMTP('smtp.gmail.com', 587)
s.starttls()
emailid = input("Enter your email: ")
s.login("YOUR Gmail ID", "YOUR APP PASSWORD")
s.sendmail('&&&&&',emailid,message)
a = input("Enter your OTP >>: ")
if a == OTP:
    print("Verified")
else:
    print("Please Check your OTP again")
```

REGISTRATION:

```
from tkinter import*
base = Tk()
base.geometry("500x500")
base.title("registration form")
labl_0 = Label(base, text="Registration form",width=20,font=("bold", 20))
labl_0.place(x=90,y=53)

lb1= Label(base, text="Enter Name", width=10, font=("arial",12))
lb1.place(x=20, y=120)
en1= Entry(base)
en1.place(x=200, y=120)
```

```

lb3= Label(base, text="Enter Email", width=10, font=("arial",12))
lb3.place(x=19, y=160)
en3= Entry(base)
en3.place(x=200, y=160)

lb4= Label(base, text="Contact Number", width=13,font=("arial",12))
lb4.place(x=19, y=200)
en4= Entry(base)
en4.place(x=200, y=200)

lb5= Label(base, text="Select Gender", width=15, font=("arial",12))
lb5.place(x=5, y=240)
var = IntVar()
Radiobutton(base, text="Male", padx=5,variable=var, value=1).place(x=180, y=240)
Radiobutton(base, text="Female", padx =10,variable=var, value=2).place(x=240,y=240)
Radiobutton(base, text="others", padx=15, variable=var, value=3).place(x=310,y=240)

list_of_cntry = ("United States", "India", "Nepal", "Germany")
cv = StringVar()
drplist= OptionMenu(base, cv, *list_of_cntry)
drplist.config(width=15)
cv.set("United States")
lb2= Label(base, text="Select Country", width=13,font=("arial",12))
lb2.place(x=14,y=280)
drplist.place(x=200, y=275)

lb6= Label(base, text="Enter Password", width=13,font=("arial",12))
lb6.place(x=19, y=320)
en6= Entry(base, show='*')
en6.place(x=200, y=320)

lb7= Label(base, text="Re-Enter Password", width=15,font=("arial",12))
lb7.place(x=21, y=360)
en7 =Entry(base, show='*')
en7.place(x=200, y=360)

Button(base, text="Register", width=10).place(x=200,y=400)
base.mainloop()

```

START AND DESTINATION

```
# import module
from bs4 import BeautifulSoup

# user define function
# Scrape the data
def getdata(url):
    r = requests.get(url)
    return r.text

# input by geek
from_Station_code = "GAYA"
from_Station_name = "GAYA"

To_station_code = "PNBE"
To_station_name = "PATNA"
# url
url = "https://www.railyatri.in/booking/trains-between-
stations?from_code="+from_Station_code+"&from_name="+from_Station_name+"&JN+&journey_date=Wed&src=tbs&to_code="
+ \
    To_station_code+"&to_name="+To_station_name + \
    "+JN+&user_id=-1603228437&user_token=355740&utm_source=dwebsearch_tbs_search_trains"

# pass the url
# into getdata function
htmldata = getdata(url)
soup = BeautifulSoup(htmldata, 'html.parser')

# find the Html tag
# with find()
# and convert into string
data_str = ""
for item in soup.find_all("div", class_="col-xs-12 TrainSearchSection"):
    data_str = data_str + item.get_text()
result = data_str.split("\n")

print("Train between "+from_Station_name+" and "+To_station_name)
print("")
```



```
# Display the result
for item in result:
    if item != "":
        print(item)
```

BOOKING :

```
print("\n\nTicket Booking System\n")
restart = ('Y')
while restart != ('N','NO','n','no'):
    print("1.Check PNR status")
    print("2.Ticket Reservation")
    option = int(input("\nEnter your option : "))
    if option == 1:
        print("Your PNR status is t3")
        exit(0)
    elif option == 2:
        people = int(input("\nEnter no. of Ticket you want : "))
        name_l = []
        age_l = []
        sex_l = []
        for p in range(people):
            name = str(input("\nName : "))
            name_l.append(name)
            age = int(input("\nAge : "))
            age_l.append(age)
            sex = str(input("\nMale or Female : "))
            sex_l.append(sex)
        restart = str(input("\nDid you forgot someone? y/n: "))
        if restart in ('y','YES','yes','Yes'):
            restart = ('Y')
        else :
            x = 0
            print("\nTotal Ticket : ",people)
            for p in range(1,people+1):
```

```

print("Ticket : ",p)
print("Name : ", name_l[x])
print("Age : ", age_l[x])
print("Sex : ",sex_l[x])
x += 1

```

PAYMENT:

```

from django.contrib.auth.base_user import AbstractBaseUser
from django.db import models
class User(AbstractBaseUser):
    """
    User model.
    """
    USERNAME_FIELD = "email"
    REQUIRED_FIELDS = ["first_name", "last_name"]
    email = models.EmailField(
        verbose_name="E-mail",
        unique=True
    )
    first_name = models.CharField(
        verbose_name="First name",
        max_length=30
    )
    last_name = models.CharField(
        verbose_name="Last name",
        max_length=40
    )
    city = models.CharField(
        verbose_name="City",
        max_length=40
    )
    stripe_id = models.CharField(
        verbose_name="Stripe ID",
        unique=True,
        max_length=50,
        blank=True,
        null=True
    )

```

```

)
objects = UserManager()
@property
def get_full_name(self):
    return f"{self.first_name} {self.last_name}"
class Meta:
    verbose_name = "User"
    verbose_name_plural = "Users"
class Profile(models.Model):
    """
    User's profile.
    """
    phone_number = models.CharField(
        verbose_name="Phone number",
        max_length=15
    )
    date_of_birth = models.DateField(
        verbose_name="Date of birth"
    )
    postal_code = models.CharField(
        verbose_name="Postal code",
        max_length=10,
        blank=True
    )
    address = models.CharField(
        verbose_name="Address",
        max_length=255,
        blank=True
    )
    class Meta:
        abstract = True
class UserProfile(Profile):
    """
    User's profile model.
    """
    user = models.OneToOneField(
        to=User, on_delete=models.CASCADE, related_name="profile",
    )
    group = models.CharField(
        verbose_name="Group type",
        choices=GroupTypeChoices.choices(),
        max_length=20,
        default=GroupTypeChoices.EMPLOYEE.name,
    )

```

```

def __str__(self):
    return self.user.email

class Meta:
# user 1 - employer
user1, _ = User.objects.get_or_create(
    email="foo@bar.com",
    first_name="Employer",
    last_name="Testowy",
    city="Białystok",
)
user1.set_unusable_password()
group_name = "employer"
_profile1, _ = UserProfile.objects.get_or_create(
    user=user1,
    date_of_birth=datetime.now() - timedelta(days=6600),
    group=GroupTypeChoices(group_name).name,
    address="Myśliwska 14",
    postal_code="15-569",
    phone_number="+48100200300",
)
# user2 - employee
user2, _ = User.objects.get_or_create(
    email="bar@foo.com",
    first_name="Employee",
    last_name="Testowy",
    city="Białystok",
)
user2.set_unusable_password()
group_name = "employee"
_profile2, _ = UserProfile.objects.get_or_create(
    user=user2,
    date_of_birth=datetime.now() - timedelta(days=7600),
    group=GroupTypeChoices(group_name).name,
    address="Myśliwska 14",
    postal_code="15-569",
    phone_number="+48200300400",
)
response_customer = stripe.Customer.create(
    email=user.email,
    description=f"EMPLOYER - {user.get_full_name}",
    name=user.get_full_name,
    phone=user.profile.phone_number,
)
user1.stripe_id = response_customer.stripe_id

```

```

user1.save()
mcc_code, url = "1520", "https://www.softserveinc.com/"
response_ca = stripe.Account.create(
    type="custom",
    country="PL",
    email=user2.email,
    default_currency="pln",
    business_type="individual",
    settings={"payouts": {"schedule": {"interval": "manual", }}},
    requested_capabilities=["card_payments", "transfers", ],
    business_profile={"mcc": mcc_code, "url": url},
    individual={
        "first_name": user2.first_name,
        "last_name": user2.last_name,
        "email": user2.email,
        "dob": {
            "day": user2.profile.date_of_birth.day,
            "month": user2.profile.date_of_birth.month,
            "year": user2.profile.date_of_birth.year,
        },
        "phone": user2.profile.phone_number,
        "address": {
            "city": user2.city,
            "postal_code": user2.profile.postal_code,
            "country": "PL",
            "line1": user2.profile.address,
        },
    },
)
user2.stripe_id = response_ca.stripe_id
user2.save()
tos_acceptance = {"date": int(time.time()), "ip": user_ip},
stripe.Account.modify(user2.stripe_id, tos_acceptance=tos_acceptance)
passport_front = stripe.File.create(
    purpose="identity_document",
    file=_file, # ContentFile object
    stripe_account=user2.stripe_id,
)
individual = {
    "verification": {
        "document": {"front": passport_front.get("id")},},
        "additional_document": {"front": passport_front.get("id")},},
    }
}

```

```

stripe.Account.modify(user2.stripe_id, individual=individual)
new_card_source = stripe.Customer.create_source(user1.stripe_id, source=token)
stripe.SetupIntent.create(
    payment_method_types=["card"],
    customer=user1.stripe_id,
    description="some description",
    payment_method=new_card_source.id,
)
payment_method = stripe.Customer.retrieve(user1.stripe_id).default_source
payment_intent = stripe.PaymentIntent.create(
    amount=amount,
    currency="pln",
    payment_method_types=["card"],
    capture_method="manual",
    customer=user1.stripe_id, # customer
    payment_method=payment_method,
    application_fee_amount=application_fee_amount,
    transfer_data={"destination": user2.stripe_id}, # connect account
    description=description,
    metadata=metadata,
)
payment_intent_confirm = stripe.PaymentIntent.confirm(
    payment_intent.stripe_id, payment_method=payment_method
)
stripe.PaymentIntent.capture(
    payment_intent.id, amount_to_capture=amount
)
stripe.Balance.retrieve(stripe_account=user2.stripe_id)
stripe.Charge.create(
    amount=amount,
    currency="pln",
    source=user2.stripe_id,
    description=description
)
stripe.PaymentIntent.cancel(payment_intent.id)
unique_together = ("user", "group")

```

REDIRECT:

```
import logging
import attr
from flask import Blueprint, flash, redirect, request, url_for
from flask.views import MethodView
from flask_babelplus import gettext as _
from flask_login import current_user, login_required
from pluggy import HookimplMarker
@attr.s(frozen=True, cmp=False, hash=False, repr=True)
class UserSettings(MethodView):
    form = attr.ib(factory=settings_form_factory)
    settings_update_handler = attr.ib(factory=settings_update_handler)
    decorators = [login_required]
    def get(self):
        return self.render()
    def post(self):
        if self.form.validate_on_submit():
            try:
                self.settings_update_handler.apply_changeset(
                    current_user, self.form.as_change()
                )
            except StopValidation as e:
                self.form.populate_errors(e.reasons)
                return self.render()
            except PersistenceError:
                logger.exception("Error while updating user settings")
                flash(_("Error while updating user settings"), "danger")
                return self.redirect()
            flash(_("Settings updated."), "success")
            return self.redirect()
        return self.render()
    def render(self):
        return render_template("user/general_settings.html", form=self.form)
    def redirect(self):
        return redirect(url_for("user.settings"))
@attr.s(frozen=True, hash=False, cmp=False, repr=True)
class ChangePassword(MethodView):
    form = attr.ib(factory=change_password_form_factory)
    password_update_handler = attr.ib(factory=password_update_handler)
    decorators = [login_required]
    def get(self):
```

```

        return self.render()
def post(self):
    if self.form.validate_on_submit():
        try:
            self.password_update_handler.apply_changeset(
                current_user, self.form.as_change()
            )
        except StopValidation as e:
            self.form.populate_errors(e.reasons)
            return self.render()
        except PersistenceError:
            logger.exception("Error while changing password")
            flash(_("Error while changing password"), "danger")
            return self.redirect()
        flash(_("Password updated."), "success")
        return self.redirect()
    return self.render()
def render(self):
    return render_template("user/change_password.html", form=self.form)
def redirect(self):
    return redirect(url_for("user.change_password"))
@attr.s(frozen=True, cmp=False, hash=False, repr=True)
class ChangeEmail(MethodView):
    form = attr.ib(factory=change_email_form_factory)
    update_email_handler = attr.ib(factory=email_update_handler)
    decorators = [login_required]
def get(self):
    return self.render()
def post(self):
    if self.form.validate_on_submit():
        try:
            self.update_email_handler.apply_changeset(
                current_user, self.form.as_change()
            )
        except StopValidation as e:
            self.form.populate_errors(e.reasons)
            return self.render()
        except PersistenceError:
            logger.exception("Error while updating email")
            flash(_("Error while updating email"), "danger")
            return self.redirect()
        flash(_("Email address updated."), "success")
        return self.redirect()
    return self.render()

```



```

def render(self):
    return render_template("user/change_email.html", form=self.form)
def redirect(self):
    return redirect(url_for("user.change_email"))

```

SEATS BOOKING:

```

def berth_type(s):
    if s>0 and s<73:
        if s % 8 == 1 or s % 8 == 4:
            print (s), "is lower berth"
        elif s % 8 == 2 or s % 8 == 5:
            print (s), "is middle berth"
        elif s % 8 == 3 or s % 8 == 6:
            print (s), "is upper berth"
        elif s % 8 == 7:
            print (s), "is side lower berth"
        else:
            print (s), "is side upper berth"
    else:
        print (s), "invalid seat number"

```

```

# Driver code
s = 10
berth_type(s)      # fxn call for berth type

s = 7
berth_type(s)      # fxn call for berth type

s = 0
berth_type(s)      # fxn call for berth type

```

NOTIFICATION:

```
import pyttsx3
from plyer import notification
import time

# Speak method
def Speak(self, audio):

    # Calling the initial constructor
    # of pyttsx3
    engine = pyttsx3.init('sapi5')

    # Calling the getter method
    voices = engine.getProperty('voices')

    # Calling the setter method
    engine.setProperty('voice', voices[1].id)

    engine.say(audio)
    engine.runAndWait()

def Take_break():

    Speak("Do you want to start sir?")
    question = input()

    if "yes" in question:
        Speak("Starting Sir")

    if "no" in question:
        Speak("We will automatically start after 5 Mins Sir.")
        time.sleep(5*60)
        Speak("Starting Sir")

    # A notification we will held that
    # Let's Start sir and with a message of
    # will tell you to take a break after 45
    # mins for 10 seconds
    while(True):
        notification.notify(title="Let's Start sir",
```

```
message="will tell you to take a break after 45 mins",
timeout=10)

# For 45 min the will be no notification but
# after 45 min a notification will pop up.
time.sleep(0.5*60)
Speak("Please Take a break Sir")

notification.notify(title="Break Notification",
message="Please do use your device after sometime as you have"
"been continuously using it for 45 mins and it will affect your eyes",
timeout=10)

# Driver's Code
if __name__ == '__main__':
    Take_break()
```

13.2 GITHUB LINK :

<https://github.com/IBM-EPBL/IBM-Project-52666-1661065613>

